CZT based Handheld Radionuclide Identifier, "radFINDER"

Jürgen Stein, Andrey Georgiev, Björn Feld, Hartmut Brands, Jürgen Fellinger

target systemelectronic GmbH, 100 Midland Road, Oak Ridge, TN 37830

A new generation of HHRIID's (Handheld Radionuclide Identification Device) for nuclear material safeguards, for nuclear inventory monitoring, for advanced warning systems and for illicit trafficking of radioactive materials smart and portable gamma spectrometers are needed. The standard handheld gamma spectrometers for such applications use NaI scintillation detectors or small CZT semiconductor detectors for gamma spectrometry and single He-3 counters or LiI(Eu) detectors for the detection of neutrons. Such detectors have their limitations especially for the identification of shielded special nuclear materials because of their relatively poor energy resolution or because of their small volume/efficiency.

Using digital signal processing (DSP) combined with improved spectrum analysing software programs and very promising new detector developments a new generation of portable hand held gamma spectrometers, the so-called *radFINDER* was developed.

The *radFINDER* integrates multi-channel analyser, amplifier, high voltage power supply, and powerful embedded computing with unique detectors for gamma and neutron radiation. As gamma radiation detector multiple CZT detector elements are implemented. Whereas large volume CZT segments are used for search and source finding functions smaller CZT crystals with excellent energy resolution will acquire gamma ray spectra. The detection of neutron presence in the radiation field is based on multiple high pressure He-3 tubes with polyethylene as moderator. The paper describes the technical parameters of the individual components. The spectroscopic characteristics will be described in detail.

The automatic nuclide identification is based on advance template matching which allows to uniquely determine shielded nuclear material. The built-in library consists of about 75 nuclides and nuclide combination templates. The paper describes the identification method and process in detail.

Email: J.Stein@target-systems-gmbh.de